

The 34th Recommendations of IAUA National Seminar

Theme:- "Application of Bio-Nanotechnology in Agricultural and Animal Sciences for Food Security" A National Seminar on "Application of Bio-Nanotechnology in Agricultural and Animal Sciences for Food Security" was held during 7-8 December 2009 at NDRI, Karnal along with the 34th IAUA Vice Chancellors Convention . Eminent scientists from ICAR, SAUs and other prestigious research institutions including 39 Vice chancellors and 15 Directors of ICAR institutes participated in the deliberations of the Seminar. There was general agreement on the need for charting a road map to achieve excellence in academics and research in nanotechnology by emphasizing on basic research, crop production practices, food & feed processing and preservation, aquaculture production, health and safety issues through bottom up approach. The following recommendations emerged out of the deliberations:

- i. Each AUs should establish a special research initiative similar to NAIP project/Niche Area Scheme in order to enhance nanotechnology in food and agriculture in the National Agriculture Research System.
 - Train the young scientists in the area of nanotechnology for capacity building in the form of trained human resource
 - Introduce bio-nanotechnology component in UG and PG curricula to facilitate hands on practical work experience alongwith theoretical knowledge
 - Encourage hosting of nanotechnology experts at SAUs and ICAR institutes for availing their sabbatical leave.
- ii. AUs, ICAR and other like DST, DBT etc can be approached for funds, can take lead by setting up research and education centers in its institutions with emphasis on creation of core capabilities and guide & assist SAUs in doing so, based on a multidisciplinary approach cutting across physical and biological sciences. Further ICAR institutes and SAUs can look for networking with the research communities and agencies working in bio- nanotechnology within India and abroad.
- iii. The Department of Science and Technology (DST) and Department of Biotechnology (DBT) should make substantial allocation of funds to initiate bio-nanotechnology based projects in agriculture, dairying, fisheries and veterinary sciences.
- iv. Government of India may be approached by AUs for more accessible and commercially focused funding for Small and Medium Enterprises as well as larger companies engaged/entering in the development of nanotechnology based products to support innovation in agricultural production, food processing & preservation, development of drugs and vaccines. These initiatives can be taken through DST, DBT, Ministry of Commerce, Ministry for Industries and Ministry of food Processing; Ministry of Agriculture; and different Development Boards.
- v. Following areas are suggested for research and development and may be taken up on priority by AUs:
- vi. Encouragement of the Application of modern tools of nano-biotechnology like molecular breeding. Nanotechnology genomics and proteomics to help selection and characterization of economically important traits, droughts and salt tolerant genes to meet the escalated demand of major cereals like rice and wheat to ensure national food security in future.
- vii. Nano-fertilizers for slow & sustained release of nutrients

- viii. Smart treatment delivery system such as drugs, pesticides, nutrients, probiotics in human, livestock and fisheries.
- ix. Nanotechnology for conserving agriculture products and convert waste into fuels and solvents
- x. There is a need for risk assessment, fix ethical boundaries, formulate appropriate regulations to ensure bio-security & safety
- xi. Exploitation of potential to develop Nano based pesticides and insecticides such as Nano sulfur, Nano Silicate, Nano-Alumina etc. for control of pests, insects, bacteria, fungi and viruses
- xii. Initiation of an era of commercial use and availability of functional biomolecules such as probiotics, prebiotics and synbiotics, food regulations need to be judiciously simplified
- xiii. Nanotechnology can be exploited for applications in disease control, livestock enhancement, commercial sterilization and extension of shelf life of foods
- xiv. Develop devices/data loggers for detection of pesticides and fertilizers for life history of agricultural commodities during storage, shipping, and delivery to store.
- xv. Design food nanostructure, oral delivery matrices, particulates, emulsions and nano-devices for enhanced food flavor and digestibility.
- xvi. Develop integrated sensing, monitoring and controlling capabilities with on board intelligence for self-regulation and remote activation for food production, storage and packaging applications.
- xvii. Design and develop automated integrated networks for monitoring and control of animal and plant production systems, food safety and security, biochemical/biomass processing or environmental monitoring applications.
- xviii. Develop Nano-bioreactor for the study of enzymatic processes, microbial kinetics, molecular ecology, mixed enzyme systems and rapid assessment of response to environmental factors.